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HEARING-PROTECTOR PLUGField of the Invention

The present invention relates to a hearing-protector
5 plug, in the following referred to as an ear plug, which
is designed to be applied in the ear and comprises means
that enable it to be detected if lost.

Description of the Prior Art

In the food industry in particular, it is important
10 that foreign objects are not lost, thereby possibly ending
up in the foodstuff. This also goes for ear plugs.

Previously, efforts have been made to eliminate this
inconvenience by interconnecting two ear plugs by a band
or a cord. Under unfavourable conditions, however, an ear
15 plug may nevertheless be lost. Further, the entire unit
comprising the two ear plugs and the band or string may,
of course, be lost as well.

In recent years, ear plugs have therefore been equip-
ped with special means that can be detected with the aid
20 of conventional detection equipment usually operating mag-
netically or electrically, whereby a lost ear plug can be
traced.

EP-A1-0,244,979 discloses the provision of a special
metal ferrule in the shank portion of an ear plug, one end
25 of a connecting cord being fixed in the metal ferrule
which in turn is mounted by press fit in an axial hole
formed in the shank of the plug. If a lost ear plug of
this type is to be detected, the metal ferrule has to stay
in place in the ear plug. However, this is not always the
30 case, and the metal ferrule may instead stick to the end
of the connecting cord. When it does, the lost ear plug,
of course, cannot be detected.

US-A-4,936,411 discloses an ear plug similar to that
described in EP-A1-0,244,979. In this case, however, a
35 detectable metal sphere is mounted in the hole formed in
the shank of the ear plug, inwardly of the fixing point of
the end of the associated connecting cord. This is meant

to ensure that the metal sphere will at all times stay with the ear plug if this is lost.

It will, however, be appreciated that a lost ear plug may easily be exposed to such conditions that it comes apart, in particular so that the shank portion of the ear plug detaches itself from the main body thereof. If so, the main body cannot possibly be detected.

Object of the Invention

The object of the present invention is to provide an improved ear plug of the type stated in the introduction to this specification, thereby obviating the above inconveniences while affording advantages of manufacturing technique and economy, without adversely affecting the other properties of the ear plug.

Summary of the Invention

This object is achieved by an ear plug presenting the features recited in the appended claims.

The ear plug according to the invention is thus mainly characterised in that the means added to give detectability is finely divided and distributed in the plug material, preferably homogeneously distributed throughout the plug. The detectable means can thus be in powder form and be an integral part of the plug material.

According to the invention, the detectable means can be simply added to the plug material before the plug is manufactured. As will be appreciated, this involves considerable advantages as to processing technique and costs.

With a homogeneous mixing of the means in the entire plug, also small pieces of a lost plug can be detected, e.g. magnetically or electrically, with the aid of conventional equipment used e.g. in the food industry.

Distributing the means in the plug material according to the invention has been found to have no negative effects on the function of the ear plug or its wearing comfort.

The detectable means advantageously consists of a metal powder, preferably iron powder. It will, however, be appreciated that any detectable powder material can be used.

5 Use is advantageously made of iron powder of the type employed in the food and pharmaceutical industries, e.g. in iron tablets. It may thus be a question of water-atomised, sponge-iron-base or electrooxidised iron pow-
10 ders. The powder particles are advantageously surface-treated prior to admixture so as to improve adhesion to the plug material and prevent oxidation.

Conveniently, the particle size of the pulverulent means should not exceed about 300 μm . The particle size is advantageously between about 50 μm and 200 μm , typically
15 about 80 μm .

When the ear plugs are moulded, especially of silicone material, the means can be admixed to the plug material prior to moulding.

When the ear plugs are made of foamed plastic, the
20 means can be admixed to the plastic material prior to foaming.

When the ear plugs are made of fine glass fibres, so-called glass down, the means can be freely distributed in the down, particularly when the plug has a special
25 outer casing. Also, the means can be applied by finishing technique.

The invention will be described in more detail below with the aid of an Example.

Example

30 For a silicone plug of the type described in our US Patent 4,314,553, where more detailed information on the plug design and so forth can be found, about 40 parts by weight of iron powder type Höganäs EO60 was employed per
100 parts by weight of silicone. The iron powder was sur-
35 face-treated by phosphatisation before being admixed to the silicone material. Then, the plug was moulded in conventional manner. The detectability of the resulting

plug corresponded to that of a metal sphere with a diameter of 2.5 mm.

For a glass down plug of the type described in our US Patent 4,614,487, where more detailed information on the design, production and so forth can be found, iron powder of the above type was loosely applied on top of the glass down piece before this was formed into a plug around a plunger and simultaneously was provided with an outer casing. After remaining treatment and handling of the plug, the iron powder was found to be freely distributed essentially throughout the plug. The amount of iron powder employed amounted to approximately three times the weight of the glass down.

In the present application, the term 'hearing-protector plug' is to be interpreted in a broad sense, thus including also a band or cord connected to the plug proper. If so, also the band or cord may, in accordance with the invention, be provided with the detectable means in the same way as the plug or plugs connected thereto. This considerably increases the detectability in banded or corded ear plugs.

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CLAIMS

1. Hearing-protector plug designed to be applied in
5 the ear and comprising means that enable it to be traced
if lost, e. g. in the food industry, with the aid of
detection equipment preferably operating magnetically or
electrically, c h a r a c t e r i s e d in that said
means is distributed in the plug material in finely-
10 divided form.

2. The plug of claim 1, c h a r a c t e r i s e d
in that said means is homogeneously distributed through-
out the plug.

3. The plug of claim 1 or 2, c h a r a c -
15 t e r i s e d in that said means forms an integral part
of the plug material.

4. The plug of any one of the preceding claims,
c h a r a c t e r i s e d in that said means is added in
powder form.

20 5. The plug of claim 4, c h a r a c t e r i s e d
in that the particle size of said means is up to about
300 μm , preferably between about 50 μm and 200 μm ,
typically about 80 μm .

6. The plug of any one of the preceding claims,
25 c h a r a c t e r i s e d in that said means consists of
iron powder.

7. The plug of any one of the preceding claims,
c h a r a c t e r i s e d by being moulded, especially
of a silicone material, said means being admixed to the
30 plug material prior to moulding.

8. The plug of any one of claims 1-6, c h a r a c -
t e r i s e d by being made of foamed plastic, said
means being admixed to the plastic material prior to
foaming.

35 9. The plug of any one of claims 1-6, c h a -
r a c t e r i s e d by being made of glass fibres, said
means being freely mixed with the fibres, especially when

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the plug has a special outer casing, or applied to the fibres by finishing technique.

10. The plug of claim 7, c h a r a c t e r i s e d by comprising between about 10 parts by weight and about 5 50 parts by weight of iron powder per 100 parts by weight of silicone material.

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INTERNATIONAL SEARCH REPORT

International Application No PCT/SE 92/00240

I. CLASSIFICATION OF SUBJECT MATTER (If several classification symbols apply, indicate all)⁶

According to International Patent Classification (IPC) or to both National Classification and IPC

IPC5: A 61 F 11/08

II. FIELDS SEARCHED

Minimum Documentation Searched⁷

Classification System	Classification Symbols
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IPC5	A 61 F
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Documentation Searched other than Minimum Documentation
to the extent that such documents are included in Fields Searched⁸

SE,DK,FI,NO classes as above

III. DOCUMENTS CONSIDERED TO BE RELEVANT⁹

Category *	Citation of Document, ¹¹ with indication, where appropriate, of the relevant passages ¹²	Relevant to Claim No. ¹³
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A	EP, A1, 0244979 (SAFER SAFETY LIMITED) 11 November 1987, see the whole document --	1
A	WO, A1, 9001914 (CABOT CORPORATION) 8 March 1990, see the whole document --	1
A	US, A, 3782379 (LAMPE) 1 January 1974, see column 3, line 14 - line 52 -- -----	1-4,7-8

* Special categories of cited documents:¹⁰

"A" document defining the general state of the art which is not considered to be of particular relevance

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"X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step

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IV. CERTIFICATION

Date of the Actual Completion of the International Search

3rd July 1992

Date of Mailing of this International Search Report

1992 -07- 08

International Searching Authority

SWEDISH PATENT OFFICE

Signature of Authorized Officer

Leif Brander
Leif Brander

**ANNEX TO THE INTERNATIONAL SEARCH REPORT
ON INTERNATIONAL PATENT APPLICATION NO. PCT/SE 92/00240**

This annex lists the patent family members relating to the patent documents cited in the above-mentioned international search report. The members are as contained in the Swedish Patent Office EDP file on 29/05/92. The Swedish Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
EP-A1- 0244979	87-11-11	CA-A- 1276565	90-11-20
WO-A1- 9001914	90-03-08	AU-D- 4220089	90-03-23
		EP-A- 0386220	90-09-12
		JP-T- 3501819	91-04-25
		US-A- 4936411	90-06-26
US-A- 3782379	74-01-01	DE-A- 2146863	72-04-06
		DE-A-B- 2166963	77-08-04
		FR-A-B- 2108040	72-05-12
		GB-A- 1360037	74-07-17
		JP-A- 51007787	76-01-22
		US-A- 3696090	72-10-03
		US-A- 3897376	75-07-29

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